

SUMMARY

S.1 Introduction

This study addresses alternatives and recommends a plan for a comprehensive solution to flood control problems in the Sacramento area, and ecosystem restoration at Folsom Dam and selected sites along the Lower American River. The project location is shown in Plate S-1. The study is part of the Federally-authorized American River Watershed Investigation. The two types of flood control alternatives are modifying levees to increase American River conveyance capacity through Sacramento, and increasing flood control storage through enlargement of Folsom Dam and Reservoir.

This document and its technical appendices support decision-making by the U.S. Army Corps of Engineers (Corps) and the non-Federal sponsors: the State of California Reclamation Board (Reclamation Board) and the Sacramento Area Flood Control Agency (SAFCA). This report integrates plan formulation with documentation of environmental effects. This report is also a supplemental environmental impact statement/supplemental environmental impact report (SEIS/SEIR). It serves to satisfy documentation requirements of the National Environmental Policy Act of 1969, as amended (NEPA), and the requirements of the California Environmental Quality Act (CEQA). This report presents a summary of information developed to date on present (without-project), and future (with and without-project) conditions; flood control and ecosystem restoration problems and opportunities; the alternative formulation process, including a description and comparison of project alternatives; and an evaluation of the environmental effects of these alternatives.

The Sacramento District of the Corps of Engineers prepared this study with close coordination by the Reclamation Board and SAFCA. Preparation of the study has also been coordinated closely with the U.S. Bureau of Reclamation (Bureau), the Federal agency with responsibility for operating Folsom Dam, and the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, two agencies that ensure protection of natural resources. The Reclamation Board serves as the State lead agency for CEQA purposes.

This long-term study supplements the 1996 Supplemental Information Report (SIR) and the 1991 Feasibility Report for the American River Watershed Investigation. This study includes the following:

- A supplemental inventory and forecast of existing and future conditions in the study area.
- Background information on flood problems and potential solutions in the Sacramento area.
- Description of the formulation and evaluation of the alternative plans, along with a comparison of the plans.

- Current information on the costs and benefits for Folsom Dam enlargement and downstream levee modification measures and plans.
- Updated cost and benefit information on the previously-considered upstream detention dam.
- Description of the environmental effects of the alternatives.
- Recommended plan and implementation requirements.

S.1.1 Authorization

Study of the American River watershed was authorized in the Flood Control Act of 1962 (Public Law 87-874) with direction from Congress given to the Corps to survey for flood control and allied purposes. Although Congress authorized the overall study of the American River watershed under this act, specific direction for the current long-term study was more recently provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (Public Law 106-53).

S.1.2 Project Background

A serious flood problem exists in the Sacramento area. Although extensive flood control work has been accomplished and additional work is scheduled for the next seven years, a need exists for additional flood protection. There is also a need to preserve and restore fish and wildlife habitat and a need for increased incidental recreation, water supply, and hydropower.

The American River watershed covers approximately 2,100 square miles northeast of Sacramento and includes portions of Placer, El Dorado, and Sacramento counties. The city of Sacramento is located where the American River converges with the Sacramento River. Folsom Dam and Reservoir as well as additional upstream reservoirs control basin runoff. The Lower American River conveys flows downstream of the dam through the Sacramento metropolitan area and into the Sacramento River. These flows are controlled by high ground in a portion of the American River and by an extensive system of levees extending along both banks of the American and Sacramento Rivers and their tributaries in the region. During very high flows in both the American and Sacramento Rivers, water is diverted into the Yolo Bypass via the Sacramento Weir and Bypass channel.

Folsom Dam and Reservoir, located on the main stem of the American River approximately 29 miles upstream from the city of Sacramento, is a multipurpose dam operated by the Bureau as part of the Central Valley Project (CVP). The maximum sustained flood control release that can be safely conveyed by the downstream channel is 115,000 cubic feet per second (cfs). This flow constitutes the “objective release” for flood management and planning purposes. As much as 160,000 cfs may be safely conveyed on a limited, emergency basis. The existing system leaves the highly urbanized Sacramento area at an unacceptably high level of flood risk. The system does not meet the community goal, as adopted by SAFCA and the Reclamation Board, of achieving a high degree of flood protection commensurate to the

catastrophic losses that could be experienced from American River flooding. The community goal is often described as reducing the flood risk to no greater than a 1-in-200 chance of exceedance in any one year.

Currently, the city of Sacramento has a 1-in-85 chance of flooding in any one year. In accordance with provisions of the WRDA of 1996 and WRDA of 1999, the American River Common Features Project currently under construction will raise and strengthen levees to reduce the risk of flooding from a 1-in-85 chance to a 1-in-100 chance in any one year. Construction of this project is scheduled for completion in 2004. The Folsom Dam Modification Project, which was authorized in the 1999 WRDA and is scheduled for completion in 2008, will enlarge the Folsom Dam outlet works and improve the use of surcharge storage. After the Common Features and Folsom Modification projects are completed, the operators of Folsom Dam will be able to evacuate flood storage space earlier in a storm event in anticipation of the need to safely store more water behind the dam. In addition, the American River levee system will be able to reliably pass the emergency spillway release. These improvements will further reduce the risk of flooding to a 1-in-140 chance in any one year. Finally, as directed by Congress in the 1999 WRDA, the Folsom Dam Flood Management Plan will be updated to gain additional flood storage space through advance release of stored water based on forecast inflow of large storms. Although the details of this advance release operation have not been developed, preliminary evaluations performed in connection with the American River Watershed Long-Term Study indicate that advance release may further reduce the overall risk of flooding to approximately a 1-in-164 chance in any one year.

Even with all of the above-described improvements in place, the Corps and Bureau have determined that Folsom Dam will not meet current Federal dam safety standards requiring all Federal dams to be capable of passing the Probable Maximum Flood (PMF) without failure. The PMF is a combination of the most extreme hydrologic events that can occur on a watershed. The Corps is responsible for developing a plan to correct this dam safety deficiency; the Bureau is responsible for implementing the plan. The current dam safety solution cost developed by the Corps includes lowering the Folsom Dam spillway 6 feet and constructing a 3.5-foot parapet wall on all dams and dikes. The plan also includes modifying the spillway at L. L. Anderson Dam, which is owned by Placer County Water Agency and controls French Meadows Reservoir located on the Middle Fork of the American River. Due to inadequate spillway capacity, L. L. Anderson Dam is expected to fail in the PMF, thus contributing additional inflow to Folsom Dam. Modifying L. L. Anderson dam would be less costly than making further modifications to the Folsom Dam. This spillway deficiency may be corrected through State of California dam safety regulations or through Federal Energy Regulatory Commission (FERC) licensing. This work, however, is not funded or scheduled. Therefore, existing conditions include inadequate dam safety as well as an unacceptable risk of flooding. The future without-project condition is that the least cost dam safety fix will be implemented. Because the funding for dam safety is constrained, the time frame for implementation is uncertain. Accordingly, to ensure the completeness of the Folsom Dam enlargement alternatives, these alternatives include measures to correct the PMF deficiency.

The Lower American River floodway between Folsom Dam and the Sacramento River is highly valued open space that provides wildlife habitat, outdoor recreation, and environmental value in the middle of a metropolitan area. Ecological problems exist in the Lower American

River caused primarily by dam and levee construction, historic dredge mining activities, and development in the river's flood plain. Although dam and levee construction has provided flood protection, hydropower generation, and recreation opportunities, the construction and operation of the structures have had severe effects on vegetation, wildlife, fisheries, and aquatic habitat of the river. The construction of Folsom and Nimbus dams blocked fish passage to the upper watershed, restricting anadromous salmonid species to the lower 23 miles of the American River. The regeneration of riparian vegetation through successional processes and the frequency of flooding of the floodplain have been significantly reduced due to reduced sediment supply and consequent lowering of the bed of the channel. With channel deepening and lowering of the water table, riparian communities have gradually changed to more upland community types that are of less value to fish and wildlife. Levee construction has narrowed the floodplain by inducing development of the former floodplain, resulting in increased flood depths and hydraulic stresses (e.g., greater bank erosion) within the leveed portion of the river. Recent studies carried out in connection with the development of a multi-objective management plan for the Lower American River have identified numerous opportunities for improving and restoring ecosystem values in this corridor.

S.1.3 Statement of Purpose and Need

The purpose of the American River Watershed Long-Term Study is to explore alternatives and identify and recommend a plan of action to increase the flood protection provided to the Sacramento area along the main stem of the American River. The objective of the Corps is to provide increased flood damage reduction consistent with Federal planning principles and guidelines. The objective of the Reclamation Board and SAFCA is to provide flood protection appropriate for a large metropolitan area. This objective is often described as reducing the flood risk to no greater than a 1-in-200 chance of exceedance in any one year. In addition to flood damage reduction, a purpose of the study is to identify opportunities and recommend a plan to restore degraded habitat conditions in the Lower American River through ecosystem restoration.

The need for increased flood protection was shown in major storm events in both February 1986 and January 1997 that resulted in very high floodflows in the American River watershed. In February 1986, high flows in the Sacramento River combined with increased outflows from Folsom Dam caused the river to rise above the objective release design of 115,000 cfs for levees protecting the city of Sacramento. Although the levees did not fail, emergency repair work was necessary for specific areas. The storm events of January 1997 created the largest precipitation peaks ever recorded at stream gaging stations on the Sacramento and American rivers. These events raised significant concern over the adequacy of the existing flood control system, which has led to a series of investigations addressing the need for improved flood protection for the Sacramento area.

S.1.4 Primary Objectives

The following flood protection and ecosystem restoration objectives were determined by the Corps, Reclamation Board, SAFCA, and others through an iterative planning process and then used to formulate alternative plans:

- Reduce flood damages in the Sacramento urban area from overflows of the American River. In this regard, the non-Federal sponsors' objective is flood protection appropriate for the catastrophic nature of American River flooding. The objective is often described as reducing the flood risk to no greater than a 1-in-200 chance of exceedance in any one year.
- Restore native plant, fish, and wildlife habitat and other environmental resources in the American River watershed.
- Develop an implementable plan that will receive consensus among the various flood control agencies, environmental agencies, Federal government, and the local community.

S.2 Major Conclusions

S.2.1 Basis for Alternative Analysis and Plan Formulation

A full array of flood control measures was developed and analyzed in previous studies. These are summarized in this report.

The 1991 Feasibility Report and the 1996 SIR identified upstream detention in the vicinity of the city of Auburn on the North Fork of the American River as the National Economic Development (NED) Plan. The NED Plan maximizes economic benefits over costs. Detention dam plans to increase flood storage were thoroughly studied in both reports. As a basic flood control measure, upstream detention is still feasible and considered the most efficient and generally the most effective means of controlling flooding on the American River. The 1991 Feasibility Report formulated a 483-foot-high roller-compacted concrete gravity dam with a capacity of 545,000 acre-feet as part of the "200-Year" plan. The 2002 American River Long-Term Study updated the costs, benefits, and accomplishments of the upstream detention measure. The net benefits of the upstream detention measure are higher than those of any other flood damage reduction measure; thus, the upstream detention plan is the most efficient plan for flood control and approximates the NED Plan. The optimal size of an upstream detention basin has not been developed. Although an upstream detention dam is likely the NED Plan, it is not considered as an alternative in the 2002 American River Long-Term Study because of the specific direction provided by Congress in WRDA of 1999 to evaluate levee raising and the raising of Folsom Dam only.

The 2002 American River Long-Term Study is supplemental to the 1991 Feasibility Report and the 1996 SIR. These previous efforts developed and analyzed a full range of flood control alternatives for the Sacramento area. The basic findings of these previous efforts remain valid. Elements of the plans developed in the previous studies have been authorized for construction. These include the Natomas Federal Project, Folsom Modification Project, and the Common Features Project.

S.2.2 Long-Term Study Flood Damage Reduction Alternatives

As specified in Section 566 of WRDA of 1999, additional flood control plan formulation for this study is limited to measures derived from two basic alternatives: downstream levee modification and Folsom Dam enlargement. Folsom enlargement (physical raise to Folsom Dam) is the only means to increase flood control surcharge storage. Through the public scoping process, a third basic measure—maximum advance release from Folsom Dam in addition to without-project advance release—was added. This was found not to be a viable alternative because without-project advance release will already have taken full advantage of Folsom Dam's advance release capability.

Eight flood damage reduction alternatives were evaluated for the current long-term study. One is no action, three are Folsom enlargement alternatives of varying sizes, three are downstream levee configurations, and one is a combination plan. The alternatives are summarized below.

S.2.3 Description of Flood Control Plan Alternatives

The 2002 American River Long-Term Study evaluated the components, accomplishments, design, operations, and environmental effects of eight candidate plan alternatives.

Alternative 1: No Action

The No-Action Alternative represents without-project future conditions and serves as the baseline against which the costs, benefits, and effects of the plans under evaluation in this analysis are measured. Under Alternative 1, no action would be taken to implement a specific plan to increase flood protection along the American River beyond that which is already authorized.

The flood risk to Sacramento would be lowered to a 1-in-140 chance in any one year once the Folsom Modifications Project is in place. The update to the Folsom Flood Management Plan could institute advance release that could further lower the flood risk to Sacramento to possibly a 1-in-164 chance in any one year.

With outlet modifications and surcharge storage in place, Folsom Dam will be able to pass only approximately 70 percent of the PMF. Folsom Dam safety would continue to be a problem for the near term. Because Folsom Dam is a major dam upstream of a heavily populated area, it would be altered to contain 100 percent of the PMF. This work, however, is unscheduled.

Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Alternative 2 increases flood control protection by raising the height of Folsom Dam by 3½ feet, thereby enlarging the flood space available in Folsom Reservoir from an elevation of 474 to 478 feet. In addition, the spillway would be lowered 6 feet, from 418 feet in elevation to 412 feet. Lowering the spillway combined with the raise would allow Folsom Dam to pass 100

percent of the PMF. The raise would increase the reservoir's storage capacity by 47,000 acre-feet.

Significant features of Alternative 2 include raising all dams and dikes using 3.5-foot concrete parapet walls, lowering the spillway 6 feet, replacing spillway piers, gates, and the spillway bridge, constructing a temporary construction bridge to detour traffic, and modifying the L. L. Anderson Dam spillway to lessen PMF flow into Folsom Dam. Borrow for embankment materials would be excavated from the Peninsula site, located between the North and South Forks of the American River at Folsom Reservoir. Peninsula materials would be barged across Folsom Reservoir.

Implementation of the 478-foot maximum flood pool elevation raise would remedy Folsom Dam's existing safety deficiency and would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-189 chance in any one year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. For economic evaluation, costs allocable to dam safety were subtracted from the project cost. Costs for dam safety were identified using the separable cost remaining benefit (SCRB) method typically used to allocate costs for multipurpose water resources projects. This alternative is economically justified and fully supportable from a Federal perspective. Risk and Uncertainty figures for all alternatives are shown in Table S-2.

Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Implementation of Alternative 3 would increase flood control protection and remedy Folsom Dam's spillway deficiency by raising the height of the dam by seven feet. The raise would be a combination of raising the concrete monolith and embankments and adding a 3.5-foot parapet wall. The raise would allow the reservoir to pass 100 percent of the PMF. The maximum design flood control pool elevation would rise from an elevation of 474 to 482 feet. The maximum design flood control pool elevation would be limited to 482 feet because this is the maximum normal operation that meets dam stability criteria without significant modifications to the dam. Alternative 3 would increase the reservoir storage capacity by 95,000 acre-feet. In addition, the L. L. Anderson Dam spillway would be widened to lower PMF inflows to Folsom Dam.

The plan components for Alternative 3 are to raise the dam and dikes with a combination of fill and concrete parapet walls, erect a temporary construction bridge to detour traffic, replace spillway gates, and modify L. L. Anderson Dam. To satisfy the additional borrow requirement, a second borrow site, located at Mississippi Bar on the west side of Lake Natoma, would be used. Material from Mississippi Bar would be barged across Lake Natoma to Willow Creek and trucked on local roads to the project sites.

Implementation of the 482-foot maximum flood pool elevation raise would remedy Folsom Dam's safety deficiency and would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-213 chance in any one year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is economically justified and fully supportable from a Federal perspective.

Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Implementation of Alternative 4 would increase flood control protection by raising the height of Folsom Dam by 12 feet, thereby enlarging the flood space available in Folsom Reservoir from an elevation of 474 to 487 feet. Raising the height of the dam by 12 feet would increase the reservoir storage capacity by 157,000 acre-feet and allow the reservoir to pass 100 percent of the PMF.

Alternative 4 was developed to represent the maximum feasible dam raise possible without extensive modifications to the structure, including foundation work that would require dewatering the reservoir.

Preliminary stability analysis indicates that a flood pool elevation greater than 482 feet would exceed safety factors designed to prevent the dam from overturning. To prevent this from happening, additional structural work would be required on the downstream face and possibly inside the concrete dam.

Implementation of the 487-foot maximum flood pool elevation raise would solve Folsom Dam's existing spillway deficiency and would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-233 chance in any one year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is economically justified and partially supportable from a Federal perspective. The difference in cost between Alternative 4 and Alternative 3 is an uneconomic increment above the Federally supportable plan, and would be borne entirely by the non-Federal sponsors.

Alternative 5: Stepped Release to 160,000 cfs

Alternative 5 consists of increasing the objective release from Folsom Dam from 115,000 cfs to 160,000 cfs. Flow is stepped incrementally from 115,000 cfs to 145,000 cfs to 160,000 cfs, depending on the severity of the storm and its effect on storage in Folsom Reservoir. Flows in excess of the without-project condition (between 115,000 and 145,000 cfs) would be conducted to the Yolo Bypass via the Sacramento Weir and Bypass. Downstream levees would be improved to avoid increasing the risk of flooding to lands adjacent to the Yolo Bypass and the Sacramento River and sloughs in the Sacramento San Joaquin Delta. This plan does not include dam safety improvements since no major modifications to Folsom Dam are involved.

Significant features of Alternative 5 include modifications to existing levees along the Lower American River. Features to mitigate higher American River flows include widening Sacramento Weir and Bypass, strengthening of 12 miles of selected levees along the Yolo Bypass, 1,000 feet of levees along the Sacramento River, and 7 miles of levees along sloughs in the Delta, and modification of local drainage facilities along the Lower American River.

TABLE S-1. Summary of Benefits and Costs of Plan Alternatives (Reported in Million \$)

Alternative	Expected Annual Probability of Exceedance (1-in-X Chance per Year)	Total First Costs	Total Annual Costs	Annual Benefits^a	Net Benefits^b
Alternative 1: No Action	0.0061 (164)	NA	NA	NA	0
Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation	0.0053 (189)	176.6	13.7	12.3	-1.4
Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	0.0047 (213)	191.6	15.1	19.2	4.1
Alternative 4: Twelve-Foot Raise/487-Foot Flood Pool Elevation	0.0043 (233)	321.1	26.7	23.4	-3.3
Alternative 5: Stepped Release to 160,000 cfs	0.0058 (172)	176.7	14.7	5.8	-8.9
Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam	0.0054 (185)	203.9	16.8	8.8	-8.0
Alternative 7: Stepped Release to 180,000 cfs	0.0051 (196)	194.6	16.2	12.2	-4.0
Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	0.0045 (222)	355.4	29.7	23.6	-6.1
Detention Dam Plan: 545,000 ac.ft.	0.0019 (526)	777.0	64.1	71.0	6.9

^a Annual benefits for the dam raise alternatives include \$0.2 million for advance replacement of Folsom Dam spillway bridge and \$3.1 in savings of the Folsom Modification Project Costs. Alternative 7 includes \$1.2 million in annual benefits for advance bridge replacement. The Detention Dam plan includes \$2.2 million in advance bridge replacement and \$12.0 million in resource replacement annual benefits.

^b Net benefits shown are total benefits minus total costs. Net benefits used for economic analysis where flood damage reduction benefits minus flood damage reduction costs. Dam safety benefits and costs were not included. The following alternatives have net flood damage reduction benefits different from total net benefits: Alternative 2 net flood damage reduction benefits are \$3.8 million; Alternative 3: \$8.1 million; Alternative 4: \$2.6 million; and Alternative 8: \$1.2 million. Alternatives 2, 4 and 8 are justified even though their total net benefits are negative.

TABLE S-2. Risk and Uncertainty Figures for Alternatives ¹

ALTERNATIVE	EXPECTED ANNUAL PROBABILITY OF EXCEEDANCE (1 in X Chance per year)	CONDITIONAL PROBABILITY OF DESIGN NON-EXCEEDENCE EVENT				EQUIVALENT LONG-TERM RISK (percent chance of exceedance)		
		1 in 50 Chance per Year (0.02)	1 in 100 Chance per Year (0.01)	1 in 200 Chance per Year (0.005)	1 in 400 Chance per Year (0.0025)	10 Years	25 Years	50 Years
Alternative 1: No Action	.0061 (164)	98.9	85.6	47.8	14.4	6	14	26
Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation	.0053 (189)	99.3	89.8	56.5	20.3	5	12	23
Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	.0047 (213)	99.6	92.4	63.5	26.1	5	11	21
Alternative 4: Twelve-Foot Raise/487-Foot Flood Pool Elevation	.0043 (233)	99.7	94.1	68.5	31.1	4	10	20
Alternative 5: Stepped Release to 160,000 cfs	.0058 (172)	98.7	87.0	52.6	18.0	6	13	25
Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam	.0054 (185)	98.9	88.7	56.2	20.6	5	13	24
Alternative 7: Stepped Release to 180,000 cfs	.0051 (196)	99.2	90.4	59.7	23.4	5	12	23
Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	.0045 (222)	99.3	92.9	68.0	31.6	4	11	20
Detention Dam Plan ²	.0019 (526)	100	99.5	94.5	76.0	2	5	9

¹ Risk and uncertainty output based on moderate advance release (minimum = 0 acre-feet; most likely = 100,000 acre-feet; maximum = 190,000 acre-feet)

² NED Plan for comparison purposes

Alternative 5 places a greater emphasis on reducing flood risk by strengthening levees and relying on more frequent high flows in the channel. Accordingly, although the risk of levee failure is reduced, the initial effects, if levee failure were to occur, would be substantial. Implementation of this project alternative would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-172 chance in any one year (with moderate advance release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically feasible; thus, there is no Federal interest in this plan.

Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Alternative 6 is designed to augment features associated with Alternative 5 by adding a new outlet at Folsom Dam to increase the early release capacity from 115,000 cfs to 145,000 cfs. After the 145,000-cfs objective release is met, the release would step up to 160,000 cfs in a manner similar to that under Alternative 5. The higher early release would result in conservation of flood storage during flood events.

Implementation of this alternative would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-185 chance in any one year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically justified; thus, there is no Federal interest in this plan.

Alternative 7: Stepped Release to 180,000 cfs

Similar to the previous two alternatives, this alternative would increase the objective release from Folsom Dam from 115,000 cfs to 145,000 cfs. Under Alternative 7, flows are stepped incrementally to a higher release of 180,000 cfs.

Implementation of this alternative would involve the same work described under Alternative 5 plus extensive additional work along the Lower American River to accommodate the 180,000-cfs flow. Components include raising and strengthening 13.5 miles of levees on north and south banks of the American River, constructing 2 miles of new levees and 1.7 miles of new floodwalls along the American River, raising Howe Avenue Bridge, and modifying two other bridges.

Alternative 7 places a greater emphasis on reducing flood risk by raising the height of levees. Accordingly, although the risk of levee failure is reduced, the initial effects, if levee failure were to occur, would be substantial. Implementation of this alternative would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-196 chance in any one year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically justified; thus, there is no Federal interest in this plan.

Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 provides high flood protection by combining all the features associated with the 160,000-cfs stepped release alternative (Alternative 5) with those of the seven-foot dam raise/482-foot flood pool elevation (Alternative 3).

Implementation of Alternative 8 would reduce the risk of flooding in Sacramento from a 1-in-164 chance to a 1-in-222 chance in any one year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. Alternative 8 is not economically justified if advanced release is part of the without-project condition. Current analysis shows that if there were no advanced release, this alternative would be marginally feasible. The dam raise would be a feasible separable first increment that would be cost shared. The addition of the stepped release as a second increment would not be economically justified. It would be a 100 percent non-Federal responsibility.

S.3 Federally-Supportable Plans

The authorizing language of Section 566 of WRDA of 1999 specifically directs the American River Watershed Long-Term Study to assess flood control through “increasing surcharge flood control storage at the Folsom Dam and Reservoir” and, in a separate subsection, through “levee modification.” Thus, all Folsom Dam enlargement alternatives were compared to identify the one enlargement alternative that best meets planning objectives and has the highest net benefits (benefits minus costs). This is the Federally-supportable Folsom enlargement plan. The Federally-supportable Folsom enlargement plan may be used as a basis for cost sharing a locally preferred plan involving enlarging Folsom Dam. Because there is no Federally-supportable downstream levee modification plan, implementation of any of these alternatives would be a local responsibility.

Alternative 3 is the Federally-supportable Folsom enlargement plan because it has the largest net benefit of the enlargement set of plans. Because this alternative includes measures to correct the existing dam safety concerns, the costs of the enlargement should be distributed among all project beneficiaries including existing water and power customers of the CVP. In addition to using a cost allocation procedure for developing project economic costs between new flood control and dam safety, the cost allocation procedure is also used to determine cost sharing. The dam safety portion of the costs would be shared between the Federal government (Bureau) and current non-Federal users in accordance with their established procedures. The costs attributable to the increased flood control facilities would be cost shared between the Federal government (Corps) and the non-Federal flood control sponsor as stipulated in Section 103 of WRDA of 1986, as amended. In this case, the costs would be 65 percent Federal and 35 percent non-Federal. The final cost allocation will not be known until the Bureau has finished their analysis of required dam safety work and that actual cost is factored into the cost allocation procedures. The Bureau’s analysis will only affect cost allocation, not the dam raise design.

Alternative 2 is a lesser plan than Alternative 3. Costs allocated to flood control would also be cost shared 65/35 percent, similar to the cost share arrangement described above. The

incremental costs of Alternative 4 over the Alternative 3 costs would be the responsibility of the non-Federal sponsor.

Alternative 8 combines the Seven-Foot Folsom Dam raise (Alternative 3) with the Stepped Release to 160,000 cfs (Alternative 5). Alternative 8 has positive net benefits, thus warranting Federal participation. The stepped release increment is uneconomic and would be 100 percent local responsibility. The dam raise increment would be cost shared.

S.3.1 NED Plan

The last reported NED Plan was the Detention Dam Plan in the 1996 SIR. The primary feature of this plan was an 894,000-acre-foot flood control-only reservoir and dam on the North Fork. Another major feature of this plan was levee work along the Lower American River, which is now being accomplished as part of the Common Features Project. With higher flood protection forthcoming via the Common Features Project and Folsom Modifications Project, a smaller upstream detention dam would likely be the NED Plan. The 545,000 acre-foot flood control dam was analyzed in the 1991 Feasibility Report. The updated first cost would be \$777 million. As with the Folsom enlargement plans, upstream detention would solve safety concerns at Folsom Dam. Accordingly, costs are allocated between flood control and Folsom Dam safety for economic evaluation and cost sharing purposes. The total annual cost allocable to flood control would be \$54.7 million. Since an upstream detention dam would reduce flood control storage requirements at Folsom Dam, this alternative would also generate water resource related benefits. The 1996 SIR estimated these additional benefits at approximately \$12 million. Net benefits (flood control benefits plus resource replacement plus advanced bridge replacement minus costs allocatable to flood control) for the detention dam would be \$16.3 million. Although the estimate for resource replacement has not been updated for the present study, the net benefits of an upstream detention dam (545,000 acre-feet) would likely exceed those for any other identified flood control plan. In that case, the upstream detention dam would remain the NED Plan. The actual size of the dam that would further maximize net benefits would need to be determined based on further studies.

S.3.2 National Ecosystem Restoration Plan

The American River Long-Term Study formulated and evaluated measures to restore portions of the Lower American River (LAR) ecosystem. Four sites in the American River Parkway and floodway with unique restoration potential were selected. In addition, measures to improve habitat for the salmon and steelhead through lowering water temperature in the LAR were evaluated. The evaluation resulted in a combination of measures that reasonably maximize improvement in the ecosystem over the cost (best buy plans). This optimization was achieved by selecting the conceptual restoration plan that created the maximum Average Annual Habitat Units (AAHU's) per dollar spent. The five components described below together form the National Ecosystem Restoration (NER) Plan. The total first cost of the NER Plan would be \$40.0 million, the total annual cost would be \$3.3 million, and the benefits would be 1,065 AAHU's. The NER components are described below:

Alternative 9.1: Urrutia Restoration Site

The Urrutia site consists of 251 acres on the north bank of the Lower American River, between river mile (RM) 1 and RM 2. The site is composed of an existing surface mining operation mostly devoid of native vegetation. The conceptual restoration plan includes the eradication of nonnative invasive plant species; terracing of existing steep banks; grading to appropriate flood plain elevations; and planting reconstructed areas with seasonal wetland and riparian forest plant species.

Alternative 9.2: Woodlake Restoration Site

The Woodlake site adjoins the upstream end of the Urrutia site and consists of 283 acres of open space located between RM 2 and RM 4. Existing site conditions are generally characterized by an unusually high flood plain that infrequently receives overbank flows. The conceptual restoration plan includes the eradication of nonnative invasive plant species; restoration of the connectivity between the river and the flood plain terrace; seeding to reestablish native grasslands; and grading to appropriate flood plain elevations and planting reconstructed areas with riparian forest oak woodland, and oak savanna plant species.

Alternative 9.3: Bushy Lake Restoration Site

The 337-acre Bushy Lake site is upstream from Woodlake, between RM 4 and RM 5.5. Two urban streams convey urban stormwater runoff into Bushy Lake with those flows then entering into the Lower American River. The conceptual restoration plan includes the eradication of nonnative invasive plant species combined with the construction of ephemeral side channels planted with emergent wetland plant species and the installation of a pump and delivery system to carry water to Bushy Lake. Further ecosystem restoration includes the creation of an ephemeral channel from the lake to convey high flows to the river; terracing steep banks; and planting riparian forest, oak woodland, and oak savanna plant species on newly-graded site areas.

Alternative 9.4: Arden Bar Restoration Site

The Arden Bar site consists of 280 acres located on the north bank, between RM 12 and RM 13, that support a 33-acre training facility used by the county sheriff's department, a 45-acre developed park site, and a 34-acre fishing pond. The conceptual restoration plan for this site includes the eradication of nonnative plant species and the reestablishment of wetland, riparian, and oak savanna plant communities.

Alternative 9.5: Folsom Dam Temperature Shutter Mechanization

The construction of Folsom Dam artificially restricted salmon and steelhead life cycles to the 23-mile Lower American River, and recent biological monitoring indicates that water temperatures in the Lower American River have tended to exceed the temperature regime necessary to sustain existing spawning and rearing salmon and steelhead populations. Maintenance of optimal water temperatures for spawning and rearing depends on the dam's ability to deliver coldwater releases to the Lower American River at critical times of the year.

Limiting factors include the actual volume of the coldwater pool behind the dam during the warmer summer and fall seasons when coldwater demand is highest combined with the structural features of the dam that provide physical access and release of this coldwater from the reservoir to the Lower American River. Virtually all the water released is through the dam's three hydropower penstock intakes. Intake shutters control the elevation and thus the temperature of the water drawn from the reservoir and released to the Lower American River. Currently, the temperature shutters are manually adjusted because of the structural features of the penstocks. This manual operation does not allow for the flexibility and timeliness needed to optimize management of the coldwater pool. An alternatives analysis determined that automation of the temperature shutters would solve the existing ecosystem problem by increasing the physical and operational capability of the penstocks, thereby optimizing the management of the coldwater pool and providing the greatest operational flexibility and responsiveness year round.

S.3.3 Environmentally Preferable Alternative/Environmentally Superior Alternative

Alternative 3 has been identified as the environmentally preferable and the environmentally superior alternative, pursuant to the requirements of NEPA and CEQA, respectively. The environmentally preferred and environmentally superior alternative is the alternative that causes the least damage to the biological and physical environment and protects, preserves, and enhances historic, cultural, and natural resources while accomplishing the project's goals.

Construction-related effects at Folsom Reservoir would be nearly the same under Alternatives 2 and 3 with the exception of air quality, transportation, and recreation. Under Alternative 3, construction-related effects would extend to Mississippi Bar as a result of excavating and hauling borrow material; however, these effects would be short term and would not extend beyond the project construction period. Recreation opportunities at Folsom Lake would return to pre-project conditions and recreation opportunities occurring at Mississippi Bar and Willow Creek Recreation Area could be enhanced once construction is completed.

Alternative 3 would also enhance flood protection along the lower American River to a level greater than under Alternative 2. Reducing the likelihood of an uncontrolled flood event would benefit both the biological and physical environment within the historic floodplain by avoiding or reducing damage attributable to a flood event.

Although the No-Action Alternative would result in no construction-related environmental effects, it would not meet the objectives of providing enhanced flood protection to the Sacramento area. The No-Action alternative would not include restoration of the sites along the Lower American River or modifications to temperature control shutters at Folsom Dam and associated benefits to terrestrial and aquatic habitats.

The selection of Alternative 3 as the environmentally preferred and environmentally superior alternative is based on the conclusions of the impact analysis in Chapter 7 of this report.

S.3.4 Optimum Trade-Off Plan

The optimum trade-off plan would be the NED Plan (likely an upstream detention dam providing approximately 545,000 acre-feet of storage) combined with the NER Plan. The NED and the NER Plans would be additive; that is, they could be combined with no effect on their individual features or benefits.

Similarly, Alternative 3, the Federally-supportable Folsom enlargement plan, and the NER Plan are additive. Alternative 3 is less optimal than the NED/NER Plan because the net benefits are less. To determine cost sharing, the Federally-supportable Folsom enlargement plan (Alternative 3)/NER Plan is treated the same as if it were the NED/NER Plan.

S.4 Recommended Plan

After public review, in October 2001, the Reclamation Board and SAFCA resolved to support, as co-sponsors, Alternative 3, Seven-Foot Dam Raise, 482-Foot Flood Pool Elevation. Alternative 3 would meet the community's flood control goals, and is the most efficient of the alternatives studied, without building upstream detention. In addition, SAFCA resolved to support and be the non-Federal sponsor for the Woodlake, Bushy Lake, and Folsom Dam temperature shutters modification increments of the NER plan. Thus the locally-preferred plan is Alternative 3, plus restoration of the Woodlake (Alternative 9.2) and Bushy Lake (Alternative 9.3) sites, and modification of the temperature shutters (Alternative 9.5). These three components are separable and could work independently, thus they may be combined to create a complete, feasible, locally-preferred plan.

All increments of the locally-preferred plan are feasible and within the Federal interest. Therefore, this plan is put forward as the recommended plan. This plan is Federally-supportable. There are no basic increments that are 100 percent local responsibility. The plan is technically complete, effective in achieving flood control and restoration goals, and fully acceptable for implementation. The plan would be efficient as it would produce a large amount of benefits for the total project cost.

S.4.1 Recommended Plan Description

Implementation of Alternative 3, Seven-Foot Dam Raise, 482-Foot Flood Control Pool Elevation would involve the following components:

Replacement of Existing Spillway Gates. All eight spillway gates at Folsom Dam would be replaced with larger gates under this plan.

Modification of Spillway Bridge Piers. Spillway bridge piers would be raised and extended downstream to anchor the new larger radial spillway gates. The piers would be further strengthened through the installation of post-tension tendons to anchor the piers to the concrete of the dam's overflow section.

Replacement of Spillway Bridge. The existing eight-span spillway bridge would require replacement because of the higher flood control pool and spillway gates. The new bridge would

be approximately 2,400 feet long and 29.5 feet wide with one through traffic lane in each direction.

Raising of the Concrete Dam. The concrete portions of Folsom Dam outside of the spillway area would be raised by construction of a parapet wall.

Raising Wing Dams and Dikes. Wing dams and dikes would be raised 3.5 feet with embankment material. A 3.5-foot-high concrete wall would be constructed on top of the left and right embankment wing dams beyond the center concrete section and on the top of the dikes around the perimeter of the reservoir.

Modification of the Elevator Tower. Components of the elevator at Folsom Dam would be modified and relocated to accommodate the raise of the existing structure.

Borrow Extraction and Hauling. Borrow for embankment materials would be excavated from the Peninsula site, located between the North and South Forks of the American River at Folsom Reservoir, and from the Mississippi Bar site, along the north side of Lake Natoma. Peninsula materials would be barged across Folsom Reservoir. Mississippi Bar materials would be barged across Lake Natoma and trucked along local roadways to the project construction site.

Location of Construction Staging Areas. Construction staging areas would be located immediately adjacent to the landside of the existing embankment dams and dikes. These locations were selected based on existing topography and environmental conditions to minimize environmental effects.

Construction of Temporary Construction Bridge. A temporary construction bridge approximately 2,400 feet in length would be constructed downstream of the left wing dam. The approach to the western end of the bridge would be approximately 1,450 feet and 3,400 feet from the eastern end. This bridge would be aligned to provide a detour route across the American River during the construction period when the spillway bridge would be unavailable for public use. After completion of the dam raise, traffic would revert to the new spillway bridge over Folsom Dam. The construction bridge would later be dismantled or left in service to facilitate dam maintenance, as determined by the Bureau.

Mooney Ridge. The increased flood pool elevation associated with this alternative could temporarily inundate the lower portions of backyard areas of six residences on Mooney Ridge in Granite Bay. The solution to this issue would be the acquisition of flood easements up to the top of the new flood control pool at the 482-foot elevation. Depending on consultation with property owners, possible alternatives include construction of a retaining wall and infill of back yards, or construction of a dike on project lands.

Additional Structural Work. Additional structural work associated with the dam raise would include the removal, enlargement, and replacement of the gantry crane at the top of the spillway bridge and the relocation and modification of the penstock wheel gates, inlet temperature shutters, and the hydraulic power units and controls.

Widen L. L. Anderson Dam Spillway. L. L. Anderson Dam (French Meadows Reservoir) spillway would be widened so that the dam would safely pass the PMF. This would lower PMF inflows to Folsom Dam.

Ecosystem Restoration. Restoration activities at the Bushy Lake and Woodlake sites would include grading and excavating soils on the flood plain and creating side channels to provide hydrology supportive of wetland riparian habitat. Nonnative vegetation would be removed and replaced with native riparian woodland. Detailed hydraulic modeling has not been conducted to evaluate the effects of restoration activities to streamflow and hydraulic channel and flood plain characteristics. However, the restoration would not include any change to the configuration of the main river channel. The changes associated with the flood plain terraces and side channels would be relatively minor considering the width of the flood plain in this reach of the river.

Real Estate Requirements. Additional lands would be acquired at a few locations where the enlarged flood pool would extend beyond the Federal project boundary. Lands would be needed for borrow and environmental mitigation.

S.4.2 Recommended Plan Impacts and Mitigation

Significant environmental effects and mitigation measures of the Recommended Plan (Alternative 3) are provided in Table S-3 and have been adopted as part of the recommended plan. Significant environmental effects that cannot be mitigated to a less than significant level are air quality, noise, and recreation. Construction of flood control improvements at Folsom Reservoir will affect air quality by exceeding emission standards for nitrates, which cannot be mitigated to a less than significant level. Noise levels are significant because of the construction of the temporary construction bridge, the roadway near Folsom Dam, and the modifications to the dikes, and the resulting diversion of vehicular traffic. Additionally, noise levels will be significant within the Mississippi Bar borrow site as a result of excavation and hauling activities. Construction-related effects that cannot be mitigated to a less than significant level include a disruption of recreation activities between Beals Point and Beeks Bight due to an increase in the height of dikes near the west shore of Folsom Reservoir and potential disruption of recreation activities at Lake Natoma due to the temporary conversion of the Willow Creek Recreation Area to a borrow material storage and transfer site. Alternate material storage and transfer sites are being considered in order to avoid the Willow Creek Recreation Area.

Adverse effects are associated with construction of the flood control elements and would not occur as part of project operation. All other effects would be considered less than significant or would be reduced to a less than significant level as a result of mitigation. The Corps has determined that this project as proposed is consistent or otherwise in compliance with the Section 40(b)(1) guidelines of the Clean Water Act and meets the requirements of Section 404(r). The Corps plans to seek an exemption under Section 404(r) of the Clean Water Act. Environmental effects of the ecosystem restoration alternatives are also provided in Table S-3. All significant effects can be mitigated to a less than significant level.

The beneficial effects of the two floodplain ecosystem restoration alternatives (Bushy Lake and Woodlake) are restoration of native vegetation and benefits to fish and wildlife habitat.

TABLE S-3. Summary of Significant Environmental Effects and Mitigation Measures

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.1 Hydrology and Hydraulics				
There are no significant effects to hydrology and hydraulics.				
7.2 Geology, Seismicity, and Soils				
Construction-related effects				
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure WQ-1: Implement pollution prevention measures. Mitigation Measure WQ-2: Implement erosion control measures.	LS	5, 6, 7, 8
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the modification of the L. L. Anderson Dam spillway; construction of flood control improvements at Folsom Reservoir; and the floodplain ecosystem alternatives	S	Mitigation Measure WQ-2: Implement erosion control measures.	LS	2, 3, 4, 8, 9.1, 9.2, 9.3, 9.4
7.3 Water Supply				
There are no significant effects to water supply.				
7.4 Hydropower				
There are no significant effects to hydropower.				
7.5 Land Use and Socioeconomics				
There are no significant effects to land use and socioeconomics.				

Notes:

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.6 Recreation				
Construction-related effects				
Disrupt recreation activities on a segment of the American River Bike Trail located between Negro Bar and Beals Point as a result of activities associated with the construction of temporary access roads and bridges	S	Mitigation Measure R-1: Provide notification of trail and road closures and establish alternative access routes. Mitigation Measure R-2: Ensure the segment of the American River Bike Trail between Beals Point and Negro Bar is reestablished.	LS	2, 3, 4, 8
Disrupt recreation activities between Beals Point and Beeks Bight as a result of construction activities associated with increasing the height of dikes near the west shore of Folsom Reservoir	S	Mitigation Measure R-3: Provide notification of trail and road closures and establish alternative access routes.	S	2, 3, 4, 8
Disrupt recreation activities on the American River Bike Trail as a result of transporting borrow material from the Mississippi Bar borrow site to the barge loading site at Willow Creek, and from Willow Creek to Folsom Boulevard	S	Mitigation Measure R-4: Provide notification of trail closure, establish alternative trail routes, and signalize or flag intersection of the bike trail and haul road.	LS	3, 4, 8
Disrupt recreation activities at Lake Natoma by temporarily converting the Willow Creek Recreation Area to a borrow material storage and transfer site	S	None Available.	S	3, 4, 8
Disrupt recreation activities on the American River Parkway trail system as a result of construction activities associated with the modification of existing drainage and pumping facilities along the Lower American River	S	Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway.	LS	5, 6, 7, 8
Disrupt recreation activities along the Lower American River as a result of activities associated with the construction of a floodwall near the Nimbus fish hatchery	S	Mitigation Measure R-5: Provide notification of trail and road closures and establish alternative access routes within the Parkway.	LS	7

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Reduce the number of available parking spaces at Goethe Park, Ancil Hoffman Park, Old Fair Oaks Bridge, and Nimbus Fish Hatchery during the construction of flood control improvements along the Lower American River	S	Mitigation Measure R-6: Provide notification of parking lot closures and identify alternative parking areas located nearest the affected area.	S	7
7.7 Fisheries				
Construction-related effects				
Affect fish and fish habitat in Folsom Reservoir as a result of sediment, fuels, and lubricants being discharged during the construction of flood control improvements at Folsom Reservoir and the fisheries ecosystem restoration alternative	S	Mitigation Measure WQ-1: Implement pollution prevention measures. Mitigation Measure WQ-2: Implement erosion control measures.	LS	2, 3, 4, 8, 9.5
Affect fish and fish habitat in Lake Natoma as a result of sediment, fuels, and lubricants being discharged during the operation of the Mississippi Bar borrow site	S	Mitigation Measure WQ-1: Implement pollution prevention measures.	LS	3, 4, 8
Affect fish and fish habitat downstream of Folsom Dam as a result of activities associated with the construction of a new outlet and modification of the spillway stilling basin	S	Mitigation Measure WQ-1: Implement pollution prevention measures.	LS	6
Affect fish and fish habitat in the Lower American River as a result of sediment, fuels, and lubricants being discharged into the river during the construction of flood control improvements along the Lower American River and the ecosystem restoration alternative	S	Mitigation Measure WQ-1: Implement pollution prevention measures. Mitigation Measure WQ-2: Implement erosion control measures.	LS	5, 6, 7, 8, 9.1, 9.2, 9.3, 9.4
Affect fish habitat in the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta Sloughs as a result of sediment, fuels, and lubricants being discharged to surface waters during the construction of flood control improvements	S	Mitigation Measure WQ-1: Implement pollution prevention measures. Mitigation Measure WQ-2: Implement erosion control measures.	LS	5, 6, 7, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.8 Vegetation				
Construction-related effects				
Loss of oak woodland and oak pine woodland at Folsom Reservoir as a result of construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure V-1: Compensate for loss of 4.8 acres of oak and pine-oak woodland.	LS	2
		Mitigation Measure V-3: Compensate for loss of 29.8 acres of oak and pine woodland.	LS	3, 4, 8
		Mitigation Measure V-5: Compensate for loss of 6.7 acres of oak and pine woodland.	LS	5, 6, 8
		Mitigation Measure V-7: Compensate for loss of 25.3 acres of oak and pine woodland.	LS	7
Affect jurisdictional waters of the United States and associated riparian and wetland vegetation communities as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure V-2: Compensate for loss of 1.3 acres of riparian woodland.	LS	2
		Mitigation Measure V-4: Compensate for Loss of 10.3 acres of riparian woodland.	LS	3, 4, 8
		Mitigation Measure V-6: Compensate for Loss of 23.2 acres of riparian woodland.	LS	5, 6, 8
		Mitigation Measure V-8: Compensate for Loss of 48.2 acres of riparian woodland.	LS	7

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.9 Wildlife				
Construction-related effects				
Temporarily disturb nesting raptors in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure W-1: Conduct preconstruction raptor survey at L. L. Anderson Dam.	LS	2, 3, 4, 8
Temporarily disturb nesting raptors in the vicinity of Folsom Reservoir as a result of construction activities associated with raising wing dams and dikes at Folsom Reservoir	S	Mitigation Measure W-2: Conduct preconstruction raptor survey in the vicinity of Folsom Reservoir, wing dams, and dikes.	LS	2, 3, 4, 8
Cause the removal of elderberry shrubs from Folsom Reservoir as a result of activities associated with raising wing dams and dikes, the construction of a temporary bridge, and the operation of borrow sites at Folsom Reservoir	S	Mitigation Measure W-3: Compensate for loss of elderberry shrubs, which provides habitat for the listed species, Valley Elderberry Longhorn Beetle (VELB).	LS	2, 3, 4, 8
Temporarily disturb nesting raptors as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure W-2: Conduct preconstruction survey for Swainson's hawk.	LS	5, 6, 7, 8
Affect potential VELB habitat as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure W-3: Compensate for loss of elderberry shrubs, which provides habitat for the listed species, VELB.	LS	5, 6, 7, 8
Increase the mortality of burrowing owls as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure W-4: Conduct burrowing owl surveys.	LS	5, 6, 7, 8
Affect giant garter snakes and their habitat as a result of activities associated with the construction of flood control improvements along the Yolo and Sacramento Bypasses	S	Mitigation Measure W-5: Based on consultation with USFWS, avoid and minimize loss of giant garter snake habitat.	LS	5, 6, 7, 8
Affect cliff swallows as a result of construction activities associated with bridge and railroad trestle modifications along the Lower American River	S	Mitigation Measure W-6: Examine bridges for use by cliff swallows.	LS	7

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Affect nesting colonies of bank swallows as a result of activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure W-7: Conduct preconstruction bank swallow surveys.	LS	7
Affect nesting raptors along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	Mitigation Measure W-1: Conduct preconstruction raptor survey. Mitigation Measure W-3: Conduct preconstruction survey for Swainson's hawk.	LS	9.1, 9.2, 9.3, 9.4
Affect nesting colonies of bank swallows along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	Mitigation Measure W-7: Conduct preconstruction bank swallow surveys.	LS	9.1, 9.2, 9.3, 9.4

7.10 Water Quality

Construction-related effects				
Impair water quality in the Middle Fork of the American River with sediment derived from ground-disturbing activities associated with the modification of the L. L. Anderson Dam spillway; impair water quality in Folsom Reservoir and the Lower American River with sediment derived from ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir; and the ecosystem restoration alternatives	S	Mitigation Measure WQ-1: Implement pollution prevention measures.	LS	2, 3, 4, 8, 9.1, 9.2, 9.3, 9.4
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from ground-disturbing activities associated with the construction of a new outlet at Folsom Dam and the fisheries ecosystem restoration alternatives	S	Mitigation Measure WQ-1: Implement pollution prevention measures.	LS	6, 9.5
Impair water quality at Folsom Reservoir and Lake Natoma with sediment derived from the excavation and transport of dredge materials from the Mississippi Bar borrow site	S	Mitigation Measure WQ-1: Implement pollution prevention measures.	LS	3, 4, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Impair water quality in the Lower American River, Yolo and Sacramento Bypasses, and along the Delta sloughs with sediment derived from ground-disturbing activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure WQ-1: Implement pollution prevention measures. Mitigation Measure WQ-2: Implement erosion control measures.	LS	5, 6, 7, 8

7.11 Cultural Resources

Construction-related effects

Affect undiscovered cultural resources in the vicinity of French Meadows Reservoir as a result of activities associated with the modification of the L. L. Anderson Dam spillway; and affect undiscovered cultural resources at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir

S

Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.

LS

2, 3, 4, 8

Affect buried cultural resources in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway; and affect buried cultural resources at Folsom Reservoir as a result of ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir

S

Mitigation Measure C-2: Stop work in case of discovery of cultural resources.

LS

2, 3, 4, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Affect potentially significant historic structures at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.	LS	2, 3, 4, 8
		Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR.		
Affect potentially significant historic structures associated with Folsom Dam as a result of construction activities conducted during the construction of a new outlet at Folsom Dam	S	Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR.	LS	6
Affect undiscovered cultural resources at Mississippi Bar as a result of using Mississippi Bar as a borrow site	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.	LS	3, 4, 8
Affect buried cultural resources at Mississippi Bar as a result of ground-disturbing activities associated with using Mississippi Bar as a borrow site	S	Mitigation Measure C-2: Stop work in case of discovery of cultural resources.	LS	3, 4, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Affect known cultural resources along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure C-1: Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project. Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR.	LS	5, 6, 7, 8
Affect undiscovered or buried cultural resources along the Lower American River as a result of ground-disturbing activities associated with the construction of flood control improvements along the Lower American River and floodplain ecosystem restoration alternatives; and affect undiscovered cultural resources in the Yolo and Sacramento Bypasses as a result of construction activities associated with the modification of the Sacramento Weir, Yolo Bypass, Sacramento Bypass, and levees in the Delta	S	Mitigation Measure C-1: Implement a Programmatic Agreement.	LS	5, 6, 7, 8
Affect historic structures along the Lower American River as a result of construction activities associated with the modification of a Union Pacific Railroad (UPRR) trestle	S	Mitigation Measure C-1: Implement a Programmatic Agreement. Mitigation Measure C-3: Evaluate properties for eligibility for listing in the CRHR.	LS	7
Affect potentially significant or NRHP-listed cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	Mitigation Measure C-1: Implement a Programmatic Agreement.	LS	5, 6, 7, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Operation-related effects				
Affect undiscovered cultural resources in the inundation zone of Folsom Reservoir as a result of fluctuating reservoir levels and human activities	S	Mitigation Measure C-1: Implement a Programmatic Agreement.	LS	2, 3, 4, 8
7.12 Traffic and Circulation				
Construction-related effects				
Affect traffic safety on roadways around Folsom Reservoir as a result of sight distance problems created by slow-moving trucks involved with the modification of Folsom Dam and associated wing dams and dikes	S	Mitigation Measure T-1: Prepare and implement a traffic safety plan.	LS	2, 3, 4, 6, 8
Affect traffic and circulation on Folsom-Auburn Road as the result of constructing a new signalized intersection at the intersection of Folsom-Auburn Road and the northern approach road to the temporary construction bridge	S	Mitigation Measure T-2: Conduct operational analysis and ensure signals are timed correctly.	LS	2, 3, 4, 8
Affect roadway safety as a result of trips generated by employees and equipment involved with the construction of flood control improvements along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta sloughs	S	Mitigation Measure T-1: Prepare and implement a traffic safety plan.	LS	5, 6, 7, 8
Adversely affect traffic safety on local roadways as a result of sight distance problems created by slow-moving trucks involve with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	Mitigation Measure T-1: Prepare and implement a traffic safety plan.	LS	9.1, 9.2, 9.3, 9.4

Notes:

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 NE = no effect

S = significant effect
 CRHR = California Register of Historic Resources
 NRHP = National Register of Historic Places

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.13 Air Quality				
Construction-related effects				
Reduce air quality by exceeding emission standards for ROG and NO _x during the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO _x in the Construction Management Plan. Mitigation Measure AQ-2: Purchase NO _x Emission Credits.	S/LS	2
Reduce air quality by exceeding emission standards for ROG, NO _x , CO, and PM10 during construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO _x in the Construction Management Plan. Mitigation Measure AQ-2: Purchase NO _x Emission Credits. Mitigation Measure AQ-3: Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan.	S/LS	3, 4, 5, 8
Reduce air quality by exceeding emission standards for ROG, NO _x , CO, and PM10 during construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO _x in the Construction Management Plan. Mitigation Measure AQ-2: Purchase NO _x Emission Credits. Mitigation Measure AQ-3: Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan.	S/LS	5, 6, 7, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Impair air quality by exceeding emission standards for NO _x and PM ₁₀ during the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	Mitigation Measure AQ-1: Incorporate and Implement Air Quality Measures for NO _x in the Construction Management Plan. Mitigation Measure AQ-2: Purchase NO _x Emission Credits. Mitigation Measure AQ-3: Incorporate and Implement Air Quality Measures for PM ₁₀ in the Construction Management Plan.	LS	9.1, 9.2, 9.3, 9.4
7.14 Noise				
Construction-related effects				
Temporarily increase noise levels at Folsom Reservoir as a result of activities associated with the construction of a temporary construction bridge and roadway near Folsom Dam and with the modifications of Dikes 1,2,3,7, and 8	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program.	S	2, 3, 4, 8
Temporarily increase noise levels at an apartment complex near Folsom Reservoir as a result of diverting traffic onto the temporary construction bridge and roadway near Folsom Dam	S	Mitigation Measure N-2: Construct a sound wall between the temporary roadway and the apartment complex.	S	2, 3, 4, 8
Temporarily increase noise levels in the vicinity of Lake Natoma as a result of excavation and hauling activities at the Mississippi Bar borrow site	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program.	S	3, 4, 8
Temporarily increase noise levels as a result of construction activities associated with the modification of levees, floodwalls, pumping stations, and utilities along the Lower American River	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program.	S	5, 6, 7, 8
Temporarily increase noise levels as a result of construction activities associated with the modification of bridges along the Lower American River	S	Mitigation Measure N-1: Develop and implement Noise Abatement Program.	S	7

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
7.15 Visual Resources				
Construction-related effects				
Change the character or quality of visual resources along the Lower American River as a result of activities associated with the construction and modification of levees	S	Mitigation Measure VR-1: Levees modified or disturbed as a result of flood control activities shall be revegetated to the greatest extent possible.	LS	7
Change the character and quality of visual resources in the Garden Highway corridor as a result of constructing a landside stability berm on the north levee between the NEMDC and the Sacramento River	S	Mitigation Measure VR-1: Levees modified or disturbed as a result of flood control activities shall be revegetated to the greatest extent possible.	S	5, 6, 7, 8
7.16 Public Health and Safety				
Construction-related effects				
Adversely affect construction worker and public safety as a result of accidental hazardous material spills, uncovering hazardous wastes, and increased wildfire risk from construction operations associated with the construction of the floodplain ecosystem restoration alternatives	S	Mitigation Measure PSF-1: Prepare and implement a public safety management plan. Mitigation Measure PSF-2: Implement a hazardous materials management plan. Mitigation Measure PSF-3: Prepare and implement a fire management plan. Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction.	LS	9.1, 9.2, 9.3, 9.4

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Adversely affect construction worker and public safety as a result of accidental hazardous material spills from construction operations associated with the construction of the fisheries ecosystem restoration alternatives	S	Mitigation Measure PSF-1: Prepare and implement a public safety management plan. Mitigation Measure PSF-2: Implement a hazardous materials management plan. Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction.	LS	9.5
Affect public safety at French Meadows Reservoir as a result of potential use conflicts between recreation activities and construction activities associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure PSF-1: Prepare and implement a public safety management plan.	LS	2, 3, 4, 8
Affect public safety at French Meadows Reservoir as a result of accidental hazardous material spills from construction operations associated with the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan.	LS	2, 3, 4, 8
Increase the potential for wildfire in the vicinity of French Meadows Reservoir as a result of operating heavy equipment during the modification of the L. L. Anderson Dam spillway	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan.	LS	2, 3, 4, 8
Affect public safety at Folsom Reservoir as a result of potential use conflicts between recreation activities and construction activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSF-1: Prepare and implement a public safety management plan.	LS	2, 3, 4, 6, 8
Affect public safety at Folsom Reservoir as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan.	LS	2, 3, 4, 6, 8
Increase the potential for wildfire in the vicinity of Folsom Reservoir as a result of operating heavy equipment during the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan.	LS	2, 3, 4, 6, 8

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TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation ^a	Mitigation	LOS After Mitigation ^a	Applicable Alternatives
Affect public health as a result of the potential for hazardous materials to become exposed during the construction of flood control improvements to wing dams and dikes at Folsom Reservoir	S	Mitigation Measure PSF-4: Conduct environmental site assessments at all construction sites before beginning construction.	LS	2, 3, 4, 8
Affect public safety as a result of the potential for recreation activities to conflict with activities associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure PSF-1: Prepare and implement a public safety management plan.	LS	5, 6, 7, 8
Affect public safety along the Lower American River and in the Sacramento and Yolo Bypasses as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements along the Lower American River	S	Mitigation Measure PSF-2: Implement a hazardous materials management plan.	LS	5, 6, 7, 8
Increase the potential for wildfire as a result of operating heavy equipment during the construction of flood control improvements along the Lower American River and in the Sacramento and Yolo Bypasses	S	Mitigation Measure PSF-3: Prepare and implement a fire management plan.	LS	5, 6, 7, 8

7.17 Public Services

Construction-related effects

Affect utility services and utility-dependent public services as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	Mitigation Measure PSV-1: Identify utility infrastructure components prior to construction.	LS	2, 3, 4, 8
Affect utility services as a result of damage caused by activities associated with the construction of flood control improvements along the Lower American River and in the Sacramento and Yolo Bypasses	S	Mitigation Measure PSV-1: Identify utility infrastructure components prior to construction.	LS	5, 6, 7, 8

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Specifically, 620 acres of disturbed habitat will be restored, in its place thirty-three acres of riparian forest, 26 acres of wetlands, and 111 acres of oak woodland/savannah will be created. Additionally, non-native vegetation will be replaced with native plants, and flood plain processes would be restored in some areas. Bushy Lake would receive a more reliable water source; therefore, the quality of the water draining into the American River from the Bushy Lake site would be improved. Lowering the floodplain and planting seasonal wetland species would increase the amount of seasonal wetland habitat available for use by native wildlife for nesting and forage. Additionally, modifying the hydrology and the construction of side-channels off the main American River channel and planting shallow aquatic, seasonal wetlands, and riparian forest species would address specific needs of the endangered Sacramento splittail, salmon, and steelhead fish species. The restoration at the Bushy Lake site would increase the availability of juvenile fish habitat and assist in the recovery and return of these species to the American River system. Reintroducing flows to Woodlake and the formation of new wetlands at the site would result in an increase in seasonal wetland habitat and improve the diversity of both the plant and wildlife communities. The fisheries restoration alternative (Shutter Modifications) will benefit aquatic habitat in the Lower American River for native fish by lowering water temperatures thus increasing survival rates for Chinook salmon and steelhead, which are the species of primary concern.

S.4.3 Areas of Controversy and Unresolved Issues

The Preferred Plan includes areas of known controversy and contains unresolved issues. The Corps has identified the need to construct a bridge that would allow traffic to be temporarily relocated off of the top of Folsom Dam during construction of the project; traffic will be restored to the top of the roadway at the completion of construction. The Bureau is also pursuing funding for construction of a bridge that would be permanently relocate traffic off the top of Folsom Dam. The cost of the permanent bridge is upwards of \$45 million. The temporary construction bridge that accomplishes the project objectives could be constructed for about \$21 million. A second issue involves the California Department of Parks and Recreation and their concerns on impacts to recreation; extensive coordination will be required to ensure that recreation impacts are minimized. Additionally, there are several unresolved issues related to truck traffic, barge operation and recreation access that will be addressed during the development of the borrow plan for Mississippi Bar.

S.4.4 Recommended Plan Costs, Cost Sharing, & Accomplishments

The total cost of the Recommended Plan is \$219.0 million. The cost allocated to flood control is \$99.0 million, which is cost shared between the Federal (\$64.8 million) and the non-Federal sponsor (\$34.2 million) for flood control. The cost allocated to dam safety is \$92.6 million. This would be cost shared between the Federal government (Bureau) and existing CVP beneficiaries that hold a responsibility for Folsom Dam. The ecosystem restoration portion is \$27.4 million, which would be cost shared between the Federal (\$17.8 million) and the non-Federal sponsor for ecosystem restoration (SAFCA) (\$9.6 million). There is no smaller-scale ecosystem restoration plan that would have greater net benefits than the locally preferred plan. Cost sharing and plan benefits and costs are summarized in Table S-4.

The Recommended Plan provides substantial flood damage reduction and ecosystem restoration benefits. Potential flood damages would be reduced by an average of \$15.9 million per year. The plan reduces the risk of flooding in Sacramento from a 1-in-164 chance in any year to a 1-in-213 chance. In terms of long-term risk, the risk of flooding during a 25-year period would be reduced from 14 percent to 11 percent. Although flood control benefits are substantial, the potential remaining (with-project) average annual flood damages would be \$56.9 million.

Folsom dam's safety deficiency would be corrected. The plan would assure Folsom Dam would hold during a PMF event. Actual benefits include lives saved, reduction in flood damage to property that would otherwise be affected by a dam failure, and avoidance of rebuilding Folsom Dam.

The locally preferred plan would also restore 620 acres of disturbed habitat at two sites within the American River parkway. Thirty-three acres of riparian forest, 26 acres of wetlands, and 111 acres of oak woodland/savannah would be created, non-native vegetation would be replaced with native plants, flood plain processes would be restored in some areas. Bushy Lake would be replenished using a more reliable water source.

The plan would improve in-stream habitat in the Lower American River for native fish. Lowered water temperatures resulting from temperature shutter modifications would increase survival rates for Chinook salmon and steelhead, which are the species of primary concern. The quality of the water draining into the American River from the Bushy Lake site would be improved.

Rebuilding the Folsom Dam spillway bridge would negate the need for a planned reconstruction or major overhaul of the bridge by the Bureau. Also, construction of new, larger spillway gates would negate the need for the currently on-going Folsom modifications project to replace gates. This would result in a cost savings to the Federal project of about \$38 million.

Finally, the plan offers an opportunity for an improved public crossing of the American River through an upgrade to the temporary construction bridge. This would remain an unrealized benefit, however, unless a local organization was to fund the incremental cost and be responsible for O&M beyond the construction period.

S.4.5 Operation and Maintenance (O&M)

The Bureau would continue to operate and maintain the existing portions of Folsom Dam that it currently has responsibility for. The non-Federal sponsor would enter into an agreement with the Bureau as necessary to facilitate its OMRR&R activities.

As part of OMRR&R for a Folsom Dam raise project, the non-Federal sponsor would provide an Adaptive Management Plan (AMP) that would include actions that would be taken if inundation results in significant loss of vegetation or damage to recreational facilities because of the higher operational flood pool created by the project. Additionally, as part of the AMP, the local sponsor would periodically conduct surveys of the vegetation along the perimeter of

TABLE S-4. Recommended Plan (Cost Sharing and Benefits)

	First Costs			Annual ² Cost	Expected Annual Benefits		Efficiency ⁵	
	Federal	Non-Federal	Total		Dam Raise	Ecosystem Restoration	Flood Control Net Benefits	Ecosystem Restoration
	(Million \$)	(Million \$)	(Million \$)	(Million \$)	(Million \$)	(AAHU)	(Million \$)	(\$/AAHU)
Raise Folsom Dam 7'								
Flood Control	64.8	34.2	99.0 ⁴	7.8	19.2 ³		11.4	
Dam Safety	92.6 ¹		92.6	7.3	N/A		N/A	
Total Flood Control and Dam Safety	157.4	34.2	191.6	15.1	19.2		4.1	
Ecosystem Restoration								
Woodlake	2.3	1.2	3.5	0.3		29.0		10,300
Bushy Lake	4.9	2.6	7.5	0.6		75.4		8,000
Temperature Shutters	10.6	5.7	16.3	1.6		789.3		2,000
Total Ecosystem Restoration	17.8	9.5	27.3	2.5		893.7		
GRAND TOTAL	175.3	43.7	219.0	17.4	N/A	N/A	N/A	N/A

¹ Cost Sharing would be developed by Bureau of Reclamation.

² Includes interest during construction, O&M.

³ Also includes (\$3.3M) advance replacement of bridge benefit, avoidance of gate reconstruction for Folsom Modifications.

⁴ Includes sunk PED costs for studies, costs subtracted when calculating annual costs.

⁵ Efficiency is computed as follows - Flood Control: benefits minus costs; Ecosystem Restoration: total annual costs divided by average annual habitat units.

Folsom Reservoir that lies in the higher operational flood pool. The sponsor would mitigate damage to vegetation attributable to the enlarged flood pool (from 474 to 482 feet elevation).

The OMRR&R costs of improvement features would normally be the responsibility of the non-Federal sponsor. However, since Folsom Dam is owned by the Federal government, the OMRR&R would continue to be performed by the Bureau, but a cost-sharing agreement would be negotiated between the non-Federal sponsor and Bureau to pay the portion of the OMRR&R costs related to the new flood control features. At Folsom Dam, the Bureau would inspect completed works.

The OMRR&R costs attributable to ecosystem restoration would be the responsibility of the non-Federal sponsor as part of the cost-sharing agreement. The maintenance costs for Bushy Lake and Woodlake include irrigation, replacement plantings, and noxious weed control. OMRR&R costs for the automated temperature control shutters on Folsom Dam would become the responsibility of the Bureau.

S.5 Implementation

S.5.1 Sponsorship

Both the Reclamation Board and SAFCA support the flood control portion of the plan that includes Folsom Dam raise and modifications to L. L. Anderson Dam. The Reclamation Board would be the non-Federal sponsor. SAFCA would be the Reclamation Board's local sponsor as required by State statute. SAFCA would also be the Corps' non-Federal sponsor for ecosystem restoration. Support is evidenced by letters of intent, displayed in the Pertinent Correspondence Appendix.

S.5.2 Future Actions

Approval of Recommended Plan

Upon transmitting this report to the Commander of the South Pacific Division in San Francisco, California, and receipt of a favorable review by the Division office, the Division Engineer will issue a "Division Engineer's Notice." This notice announces the completion of this feasibility report by the Sacramento District Engineer. Concurrently with the notice, the Division Engineer will transmit the report to the Corps Headquarters in Washington D.C. This feasibility report will receive a final policy compliance review by Headquarters' staff prior to releasing the report for a final 30-day Federal agency review. A copy will also be provided to the State of California (via the Governor's office) for final State review and comment. Corps Headquarters will file the report with the Environmental Protection Agency. This will result in a mandatory NEPA 30-day review of the final SEIS/SEIR. These mandatory review periods will run simultaneously. After Corps Headquarters review, state and agency review, and a 30-day public review (for NEPA and CEQA), Corps Headquarters will prepare a Chief of Engineer's Report. This report will be submitted to the Assistant Secretary of the Army for Civil Works, who, in turn, will coordinate with the Office of Management and Budget (OMB) and submit the report to Congress. Congressional authorization is required before construction may begin.